Testimony of

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On

EMERGING CONTAMINANTS UNDER THE CLEAN WATER ACT

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Good Afternoon Chairwoman Johnson and members of the Subcommittee. I appreciate the opportunity to present testimony on the important problem of emerging contaminants in the surface waters of the United States, and to present my perspective on how the Clean Water Act might better handle this type of problem. My comments also address some aspects of avoiding such future problems before they become as serious as the ones we presently face.

I am an environmental scientist with over 35 years of experience in dealing with environmental programs as a researcher, consultant and university instructor. Much of my work has been related to the Clean Water Act concerning water quality issues, wetlands, the Chesapeake Bay Program, contaminated sediments, etc. I have also served on the National Academy of Sciences Board on Environmental Studies and Toxicology and on three Environmental Protection Agency advisory committees on endocrine disrupting chemicals (EDCs).

The problem of emerging contaminants is one that has become apparent in the past 15 to 20 years as scientists and water resource managers have examined water quality issues more closely. The US Geological Survey defines the topic of emerging contaminants on the web site: (http://toxics.usgs.gov/regional/emc/)

*"Emerging contaminants" can be broadly defined as any synthetic or naturally occurring chemical or any microorganism that is not commonly monitored in the environment but has the potential to enter the environment and cause known or suspected adverse ecological and(or) human health effects. In some cases, release of emerging chemical or microbial contaminants to the environment has likely occurred for a long time, but may not have been recognized until new detection methods were developed. In other cases, synthesis of new chemicals or changes in use and disposal of existing chemicals can create new sources of emerging contaminants.*

The history of this story provides some important context and scientific evidence that affects what action Congress takes on this issue. In 1991, Dr. Anna Soto and her colleagues reported that plasticizers leaching out of labware were stimulating breast cancer cells to grow in lab culture. Her work demonstrated conclusively that plastics leach chemicals that are biologically active and able to stimulate disease under lab conditions.

Soon after Soto published her work on estrogenic properties of plasticizers and other chemicals, Colborn and Clement (1992) published a summary of work on humans, fish, birds and other animals affected by such chemicals and at very low concentrations in the environment. This publication began a substantial effort into understanding Endocrine Disrupting Chemicals. That effort resulted in research initiatives around the world, numerous scientific publications and Congressional action. In 1996, Congress directed EPA to develop a program to screen and test about 80,000 chemicals in commerce to protect against endocrine disruption (Safe Drinking Water Act and Food Quality Protection Act). Scientists and managers were now coming to understand that low levels of chemicals can alter the way animals function without killing them- the chemicals can change their physiological functions and leave them alive and not functionally normal.

Government agencies and scientific organizations published a number of research summaries on the state of the scientific knowledge of endocrine disruptors in every type of animal. We all concluded that animals from worms to human were susceptible to this problem and some were already experiencing impacts. One result of this effort was that federal agencies and independent scientists began to look more closely for the sort of problems and conditions that many of us predicted would be found. More evidence soon came from these investigations.

The research group of Dr. John Sumpter in England (Harries et al., 1997) first reported that the effluent from sewage treatment plants was causing male fish to develop female characteristics in a number of English rivers. After this work was repeated in the US, scientists looked more closely at chemicals in effluents, waters, sediments and fish. Since then, numerous researchers around the US and the world have found biologically active chemicals in streams and effluents. Male fish were affected by water borne contaminants that caused them to develop female characteristics. Scientists then turned their attention to determining the cause or causes of sex changes in aquatic animals.

One of my colleagues, Dr. Rob Hale, from the Virginia Institute of Marine Sciences of William and Mary, a sister University in Virginia, found that flame retardants were accumulating in rivers and fish (Hale et al., 2001). The flame retardants are just one class of chemicals now found throughout waters, sediments and fish. These chemicals were on the list of the possible causes of endocrine disruption.

One of the efforts to identify biologically active chemicals in water was undertaken by USGS. Staff completed surveys of US streams to assess the extent and nature of chemicals that come from human sources and are found in our rivers, lakes and streams. In a survey of 139 streams, Kolpin's group (Barnes et al., 2002) identified chemicals that come from farms, homes, leach from plastic bottles and can linings, drugs, industrial chemicals, legacy contaminants, some of which have been banned, and the by-product of nicotine and chemicals derived from human waste that are never broken down before discharged from the sewage treatment plants. I include below a figure taken from one of the USGS reports (Barnes, et al., 2002), showing the percentage of the 139 water samples that had each of the most commonly found chemicals. The numbers are startling in terms of the extent to which our nations streams have these by-products of human activities (http://toxics.usgs.gov/regional/emc/streams.html).

Kolpin et al. 2002 found phthalates, phenolics, pesticides, metals, pharmaceuticals, legacy chemicals and more. Legacy chemicals that are present and pose health threats include the banned pesticide DDT, Kepone, chlordane, dieldrin and industrial chemical polychlorinated bi-phenyls (PCBs) that were supposed to be removed from the market 30 years ago and contaminate our waters, the rivers sediments and the fish in our rivers, bays and estuaries. This one chemical still contaminates thousands of waters throughout the US.

The legacy chemicals are now a part of the problem we face from past activities, some, such as PCB's, widespread in the environment. The significance of the legacy problems is that living systems are already exposed to a combination of chemicals that can combine to affect normal functions.

I recognize that while the mere presence of so many human-derived chemicals is of concern to many people, still others want to know what, if any harm comes from these chemicals. Are these chemicals contaminating the waters, sediments and animals, causing harmful effects, or are these chemicals just there?

There is some scientific information on the issue of what effects these chemicals may have on living systems, both humans and ecological resources. I do not present here an exhaustive review of the biological activity of all the chemicals reported by Kolpin and colleagues, or other scientists working on emerging chemicals. Rather, I want to point out that there is information on the effects, derived from federal agency reports and the peer reviewed published research. The Agency for Toxic Substances and Disease Registry (ATSDR) has toxicological profiles for some of the more common chemicals or groups of chemicals, including the flame retardants, PBDEs, phthalates, bisphenol-A, creosote constituents (PAH's), most pesticides and most metals. These reports and summaries provide some toxicological information, but on a limited number of animals, rarely on people, and only within a certain range of concentrations. Equally as important, there is little, if any information on how these chemicals act in the mixtures and combinations that occur in the real world.

The limitations we face right now with regulating and understanding emerging chemicals are based in the approach to research and regulation of chemical discharges into waters under the Clean Water Act. Research is largely conducted on single chemicals on model systems under controlled conditions and fairly high exposure levels. Little, if any work is done on mixtures and at lower levels over long periods looking for harm other than death. Regulations are similarly focused on individual chemicals, and notably those that are specifically listed in the Clean Water Act.

The Clean Water Act does not list all 80,000 chemicals in commerce and there is no toxicological information on most of those chemicals. Combinations or mixtures of chemicals are not listed at all in the Clean Water Act and neither EPA nor state agencies that administer the permit program in most cases do not address mixtures, only individual chemicals. The chemicals that Kolpin et al. list are not regulated as a group and many are not regulated at all under the Clean Water Act.  And is it practical to regulate 80,000 chemicals one at a time?

These chemical mixtures do, however, occur in waters and in fish, as well as in human tissues. The Centers for Disease Control and Prevention (CDC) conducts a regular survey of chemicals in the US population and reports finding a number of these compounds. In addition, fish tissue surveys report finding PCBs, phthalates, PBDE’s, DDT, other organic toxic chemicals and various toxic metals in numerous water bodies around the country, some in the Potomac River.

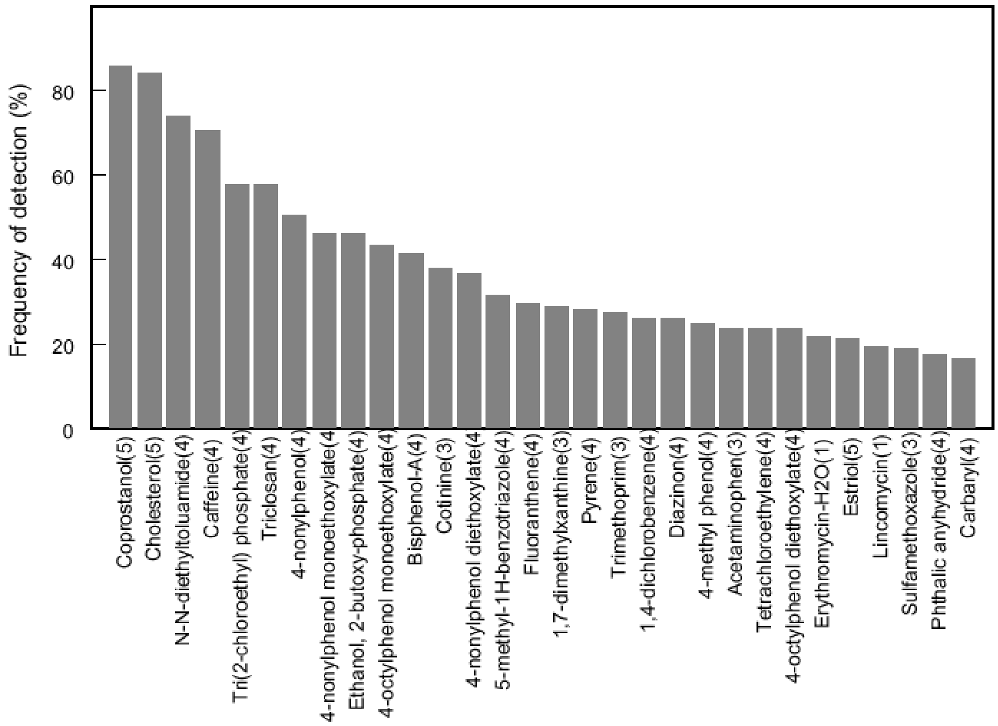
A new approach is needed under the Clean Water Act to address two of these problems: the occurrence of mixtures and the presence of chemicals that are not specifically listed. EPA and state agencies have to be able to control chemicals for which there are not yet water quality criteria or standards.

At present, agencies can set limits on the discharge of specific chemicals, and place limits in the discharge permits. The problem is that the regulatory permit limits are based not on pro-active, but on reactive monitoring. Agencies tend to depend on both knowledge of chemical toxicity and that a facility process can produce a specific chemical. If a state agency or EPA does not have specific data on both toxicology and probability of discharge, then regulation is not likely.

The Clean Water Act could require monitoring and reporting of all chemicals in discharges, regardless of the identity and chemical nature. The Clean Water Act could be more clear about requiring toxicological testing of the type that revealed problems with fish, known as caged fish studies. Congress could also make revolving loans once again available to upgrade POTW’s to permit state-of-the-art processes and equipment to remove many of these chemicals.

The most cost effective approach to dealing with the presence of so many emerging contaminants is to not discharge them in the first place. The burden of proof can and should be shifted to assume that chemicals not already present will not be benign, and that increases in the concentrations of chemicals already found there are acceptable.

To summarize, the problem of emerging contaminants arose over the past two decades as the scientific community discovered new and important information about environmental toxicology. We now face the situation with hundreds or thousands of chemicals in our daily lives, our food supply, our waters, and we are not sure how these are affecting us. Under the Clean Water Act, some new approaches can offer improvements in how EPA regulates this vast array of chemicals. Pollution prevention remains as the most cost effective way to deal with this issue.




Most frequently detected compounds in a survey of pharmaceuticals and other emerging contaminants in streams in the U.S. Taken from USGS open file report 02-94, Barnes et al., 2002.

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